

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (*Currently Amended*) A storage apparatus, comprising:

a processor;

a memory;

at least one storage device operable to provide storage resources for storing user data over a network to at least one network entity and comprising a plurality of virtual volumes;

a storage controller, coupled to the at least one storage device;

a network interface connectable to the virtual local area network (VLAN) switch;

a user interface;

wherein the processor is at least intermittently coupled to the memory, the storage controller and the network interface;

wherein the memory comprises configuration information including information on at least one ~~group file system~~, the at least one file system being used by a computer different from the storage apparatus to store data in the storage apparatus, each file system being managed by each of a plurality of file server modules, information on mapping of a plurality of segments of a virtual local area network (VLAN) connectable by the network interface to the at least one ~~group file system~~ file system and information on mapping of the plurality of virtual volumes of the at least one storage device to the at least one ~~group file system~~ file system;

wherein the processor, the memory, the storage controller and the network interface are operable to control the virtual local area network (VLAN) switch to map the plurality of segments to the at least one ~~group~~ file system and the plurality of virtual volumes to the at least one ~~group~~ file system based upon the configuration information; [[and]]

wherein at least one of the processor or the network interface control access to the plurality of virtual volumes based upon the configuration information such that a specific network entity associated with at least one of the plurality of segments is allowed to access the plurality of virtual volumes within the at least one ~~group~~ file system;

wherein the user interface is operable to provide a user with information on mapping between the at least one file system and the plurality of segments of the virtual local area network (VLAN) and information on mapping between the at least one file system and the plurality of virtual volumes; and

wherein at least one of the processor, the memory, the storage controller and the user interface is operable to update the configuration information based on a request of the user mapping and un-mapping the plurality of segments of the VLAN to the at least one file system and update the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

2. (Original) The apparatus of claim 1,
further comprising an out of band management interface connectable to a second network.

3. (*Original*) The apparatus of claim 1,
wherein the network interface connectable to a virtual local area network (VLAN) switch comprises an interface to a VLAN trunk line.

4. (*Original*) The apparatus of claim 3,
wherein information carried by the VLAN trunk line is identified using an embedded tag.

5. (*Previously Presented*) The apparatus of claim 1,
wherein the network interface connectable to a virtual local area network (VLAN) switch comprises an interface to a VLAN switch, the VLAN switch connectable to at least one host computer via at least one VLAN access link.

6. (*Previously Presented*) The apparatus of claim 5,
wherein information carried by the at least one VLAN access link comprises untagged frames.

7. (*Previously Presented*) The apparatus of claim 6,
wherein information carried by the at least one VLAN access link is identified using a VLAN Identifier of a receiving port.

8. (*Previously Presented*) The apparatus of claim 6,
wherein information carried by the at least one VLAN access link is identified using a Media Access Control (MAC) address.

9. (*Original*) The apparatus of claim 6,
wherein an untagged frame comprises:

- a preamble field;
- a source MAC field;
- a destination MAC field;
- a type field;
- a data field; and
- a CRC field.

10. *(Currently Amended)* A method, comprising:

separating logically a local area network into a plurality of virtual local area networks, including a first virtual local area network and a second virtual local area network;

separating logically a storage device operable to provide storage resources for storing user data over the local area network to at least one network entity into a plurality of virtual volumes, including a first virtual volume and a second virtual volume;

establishing at least one ~~group~~ file system, the at least one file system being used by a computer different from the storage device to store data in the storage device, each file system being managed by each of a plurality of file server modules;

managing a configuration comprising a mapping of the plurality of virtual local area networks to the at least one ~~group~~ file system and a mapping of the plurality of virtual volumes to the at least one ~~group~~ file system; and

routing information from a network entity associated with one of the plurality of virtual local area networks to the plurality of virtual volumes and preventing communication from a second network entity not associated with the plurality of virtual local area networks to the plurality of virtual volumes based upon the configuration;

wherein the managing, routing and preventing is performed by the storage device;

providing a user with information on mapping between the at least one file system and at least one of the first virtual local area network and the second virtual local area network and information on mapping between the at least one file system and the plurality of virtual volumes;

updating the configuration information based on a request of the user mapping and un-mapping the at least one of the first virtual local area network and the second virtual local area network to the at least one file system; and

updating the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

11. (Original) The method of claim 10,

further comprising at least one of:

- configuring network parameters;
- configuring a new file system;
- configuring a designated file system; and
- deleting a designated file system.

12. (Original) The method of claim 10,

further comprising at least one of:

- updating a management interface IP address;
- updating a physical network interface IP address;
- updating a VLAN interface IP address and a VLAN tag;

deleting a designated VLAN interface; and
adding a new VLAN interface.

13. (*Original*) The method of claim 10,

further comprising at least one of:

adding a VLAN to a file system;
removing a VLAN from the file system;
adding a volume to the file system; and
removing a volume from the file system.

14. (*Original*) The method of claim 10,

further comprising:

authenticating user authority.

15. (*Currently Amended*) A computer program product embodied in a computer-readable medium, comprising:

code for sending and receiving tagged frames to and from a network interface;
code for managing a file system and providing storage resources for storing user data over a network to at least one network entity;
code for managing a plurality of virtual volumes within the file system;
code for controlling data transfer between the network interface and a storage controller of the file system;

code for creating at least one ~~group~~ file system, the at least one file system being used by a computer different from a storage device to store data in the storage device, each file system being managed by each of a plurality of file server modules;

code for managing a configuration comprising a mapping of the plurality of virtual volumes to the at least one ~~group~~ file system and mapping of a plurality of a virtual local area network segments to the at least one ~~group~~ file system;

code for routing information from a network entity associated with at least one of the plurality of virtual local area network segments to the plurality of virtual volumes in the file system and preventing communication from at least one other virtual local area network segment to the plurality of virtual volumes based upon the configuration;

code for providing a user with information on mapping between the at least one file system and the plurality of a virtual local area network segments and information on mapping between the at least one file system and the plurality of virtual volumes;

code for updating the configuration information based on a request of the user mapping and un-mapping at least one of the plurality of virtual local area network segments to the at least one file system; and

code for updating the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system; and

a computer readable storage medium for holding the codes, wherein the managing of the configuration, routing and preventing are performed by a storage device hosting the file system.

16. *(Previously Presented)* The computer program product of claim 15, further comprising at least one of:

- code for receiving configuration information for the file system;
- code for receiving configuration information for the virtual volume; and
- code for receiving configuration information for the virtual local area network segment.

17. *(Previously Presented)* The computer program product of claim 16, further comprising at least one of:

- code for updating configuration information for the file system;
- code for updating configuration information for the virtual volume; and
- code for updating configuration information for the virtual local area network segment.

18. *(Currently Amended)* A network storage apparatus, comprising:

- a means for processing information;
- a means for connecting to a virtual local area network (VLAN) switch; and
- a user interface means;

wherein the means for processing and the means for connecting to a virtual local area network (VLAN) switch are connectable to a storage device operable to provide storage resources for storing user data over a network to at least one network entity having a plurality of virtual volumes mapped to at least one group file system, the at least one file system being used by a computer different from the storage apparatus to store data in the storage apparatus, each

file system being managed by each of a plurality of file server modules, and a plurality of segments of a virtual local area network (VLAN) mapped to the at least one ~~group~~ file system, based upon configuration information managed by the processing means, thereby enabling communication between a network entity associated with one of the plurality of segments of the virtual local area network and the plurality of virtual volumes and preventing communication between another segment of another VLAN and the plurality of virtual volumes;

wherein the user interface means is operable to provide a user with information on mapping between the at least one file system and the plurality of segments of the virtual local area network (VLAN) and information on mapping between the at least one file system and the plurality of virtual volumes; and

wherein at least one of the processing means and the user interface means is operable to update the configuration information based on a request of the user mapping and un-mapping the plurality of segments of the VLAN to the at least one file system and update the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

19. *(Currently Amended)* A storage apparatus, comprising:
- a means for processing information;
 - a means for storing data operable to provide storage resources for storing user data provided over a network to at least one network entity;
 - a means for controlling storing of data;
 - a means for connecting to a virtual local area network (VLAN) switch; and

a user interface means;

wherein the means for processing, the means for controlling storing of information and the means for connecting to a virtual local area network (VLAN) switch map a plurality of segments of a virtual local area network (VLAN) to at least one ~~group~~ file system, ~~the at least one file system being used by a computer different from the storage apparatus to store data in the storage apparatus, each file system being managed by each of a plurality of file server modules,~~ and map a plurality of virtual volumes of the means for storing data to the at least one ~~group~~ file system based upon configuration information, enable communication between a network entity associated with one of the plurality of segments of the virtual local area network and the plurality of virtual volumes and prevent communication between another segment of another VLAN and the plurality of virtual volumes;

wherein the user interface means is operable to provide a user with information on mapping between the at least one file system and the plurality of segments of the virtual local area network (VLAN) and information on mapping between the at least one file system and the plurality of virtual volumes; and

wherein at least one of the means for processing, the means for controlling storing of information and the user interface means is operable to update the configuration information based on a request of the user mapping and un-mapping the plurality of segments of the VLAN to the at least one file system and update the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

20. (Currently Amended) A system, comprising:

a storage device operable to provide storage resources for storing user data over a network to at least one network entity;

a virtual local area network (VLAN) switch, coupled to the storage device; and

a plurality of segments coupled to the virtual local area network (VLAN) switch via at least one virtual local area network; and

a user interface,

wherein the storage device is operable to map the plurality of segments of the virtual local area network to at least one ~~group~~ file system, the at least one file system being used by a computer different from the storage device to store data in the storage device, each file system being managed by each of a plurality of file server modules, and map a plurality of virtual volumes of the storage device to the at least one ~~group~~ file system, based upon configuration information, and is operable to enable communication between a second network entity associated with one of the plurality of segments of the virtual local area network and the plurality of virtual volumes prevent another segment of another VLAN from communicating with the plurality of virtual volumes of the storage device;

wherein the user interface is operable to provide a user with information on mapping between the at least one file system and the plurality of segments of the virtual local area network (VLAN) and information on mapping between the at least one file system and the plurality of virtual volumes; and

wherein at least one of the storage device and the user interface is operable to update the configuration information based on a request of the user mapping and un-mapping the plurality

of segments of the VLAN to the at least one file system and update the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

21. (*Currently Amended*) A method of controlling accesses from servers to a network storage subsystem, wherein the network storage subsystem is connected to a virtual local area network (VLAN) switch via a VLAN switch and receives access requests from the servers via the VLAN switch, the method comprising the steps of:

allocating a plurality of dedicated storage resources for storing user data provided over a network to at least one network entity to each of a plurality of VLAN segments,

receiving a Internet Protocol (IP) packet based access from a server,

determining a VLAN segment of the plurality of VLAN segments that the server belongs to, based on a VLAN identification in the IP packet, and

permitting the server to access the plurality of dedicated storage resources allocated to a ~~group~~ at least one file system, the at least one file system being used by a computer different from the network storage subsystem to store data in the network storage subsystem, each file system being managed by each of a plurality of file server modules, associated with the VLAN segment that the server belongs to, and preventing another server that does not belong to the plurality of VLAN segments from accessing the plurality of dedicated storage resources based on configuration information managed by the network storage subsystem, the configuration information comprising information on at least one ~~group~~ file system, information on mapping of the plurality of VLAN segments to the at least one ~~group~~ file system and information on mapping of the plurality of dedicated storage resources to the at least one ~~group~~ file system[[;]] ,

wherein the determining, permitting and preventing are performed by the network storage subsystem;

providing a user with information on mapping between the at least one file system and at least one of the first virtual local area network and the second virtual local area network and information on mapping between the at least one file system and the plurality of virtual volumes;

updating the configuration information based on a request of the user mapping and un-mapping the at least one of the first virtual local area network and the second virtual local area network to the at least one file system; and

updating the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

22. *(Currently Amended)* A method, comprising:

separating a virtual LAN into a plurality of segments;

managing a mapping of each one of the plurality of segments to ~~a group~~ at least one file system, the at least one file system being used by a computer different from a storage system to store data in the storage system, each file system being managed by each of a plurality of file server modules, and mapping of a plurality of storage devices operable to provide storage resources for storing user data over a network to at least one network entity to the ~~group~~ file system;

assigning a plurality of virtual volumes to the ~~group~~ file system and assigning a plurality of segments to the ~~group~~ file system; [[and]]

controlling access to the plurality of virtual volumes, such that the plurality of virtual volumes will communicate only with the plurality of segments within the same group file system; wherein the managing and controlling is performed by the storage device,

providing a user with information on mapping between the at least one file system and at least one of the plurality of segments and information on mapping between the at least one file system and the plurality of virtual volumes;

updating the configuration information based on a request of the user mapping and un-mapping the at least one of the plurality of segments to the at least one file system; and

updating the configuration information based on the request of the user mapping and un-mapping the plurality of volumes to the at least one file system.

23. *(Currently Amended)* The storage apparatus of claim 1, wherein the group file system comprises a file system.

24. *(Currently Amended)* The method of claim 10, wherein the group file system comprises a file system.

25. *(Currently Amended)* The computer program product of claim 15, wherein the group file system comprises a file system.

26. (*Currently Amended*) The network storage apparatus of claim 18, wherein the ~~group~~ file system comprises a file ~~system~~.

27. (*Currently Amended*) The storage apparatus of claim 19, wherein the ~~group~~ file system comprises a file ~~system~~.

28. (*Currently Amended*) The system claim 20, wherein the ~~group~~ file system comprises a file ~~system~~.

29. (*Currently Amended*) The method of claim 21, wherein the ~~group~~ file system comprises a file ~~system~~.

30. (*Currently Amended*) The method of claim 22, wherein the ~~group~~ file system comprises a file ~~system~~.